Faculty Working Papers

CANTILLON'S MACROECONOMICS

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College of Commerce and Business Administration
University of Illinois at Urbana-Champaign

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Summary

Cantillon saw output as bounded by supply but labor as reproducible. The population the available physical stock of land could support would depend, therefore, on the labor intensity of the necessities required to reproduce labor as well as on the labor intensity of the luxuries demanded by landlords according to their "Tastes, Humours and Manner of Living." Absentee owners———and their ladies———might prefer luxuries with low labor intensity, thus jeopardizing employment.

The paper restates Cantillon's model in simple algebra and solves it for real factor prices, physical outputs and real income distribution, and sustainable employment. The restatement simulates his conclusions.

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CANTILLON'S MACROECONOMICS

By HANS BREMS*

Two macroeconomic schools of thought may be distinguished. One sees output as bounded by demand. Supply is no problem: Demand will generate its own supply. This is the economics of J. M. Keynes, but the school is the older of the two; mercantilist thinking was dominated by it. The other school sees output as bounded by supply. Demand is no problem: Supply will generate its own demand. This is the economics of J. B. Say, but the idea of a supply boundary has its origin in Cantillon.

In an age once again concerned with population and scarce natural resources it may be proper to take another look at Richard Cantillon (1697-1734). What he wanted to do was to determine how much employment an economy would support, given its available stock of land. Cantillon's economics lends itself well to algebraic restatement.

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I. NOTATION

Variables

C ≡ labor's necessary consumption

L ≡ labor employed

P ≡ price of goods

R ≡ money rent bill

r ≡ money rent rate

W ≡ money wage bill

w ≡ money wage rate

X ≡ physical output

Parameters

a ≡ labor absorbed per physical unit of output

b ≡ physical stock of land used per physical unit of output

c ≡ necessary consumption per man employed

$N \equiv$ available physical stock of land

II. A CANTILLON MODEL

We like to do our macroeconomics by imagining an economy producing a single good. To Cantillon, however, the allocation of output between necessities and luxuries was crucial for employment. So let our economy be producing two goods, i. e., a necessity consumed only by labor and a luxury consumed only by landlords. Both goods, then, are consumers' goods; there are no capital goods in Cantillon's world. Both consumers' goods are produced solely from labor and land in processes having fixed input-output coefficients:

$$L_i = a_i X_i \tag{1}$$

$$N_i = b_i X_i \tag{2}$$

where subscripts $i \equiv 1, 2$ refer to the necessity and the luxury, respectively. Labor is absorbed and land is used in the production of both goods, so $a_i > 0$ and $b_i > 0$. Consequently

$$L = L_1 + L_2 \tag{3}$$

$$N = N_1 + N_2 \tag{4}$$

Like von Neumann, Cantillon saw labor as produced from necessary consumers' goods in a process having an input-output coefficient fixed, not by biology alone but also by the "manière de vivre":

$$C_1 = c_1 L \tag{5}$$

A good econometrician, Cantillon made (p. 71-73)

> estimates of the amount of Land required for the support of a Man according to the different assumptions of his

> Manner of Living. It will be seen that a Man who lives on Bread, Garlic and Roots, wears only hempen garments, coarse Linen, Wooden Shoes, and drinks only water, like many peasants in the South of France, can live on the produce of an Acre and a half of Land of medium goodness, yielding a sixfold harvest and resting once in 3 years. On the other hand a grown-up Man who wears leather Shoes, Stockings, Woollen Cloth, who lives in a House and has a change of Linen, a Bed, Chairs, Table, and other necessaries, drinks moderately of Beer or Wine, eats every day Meat, Butter, Cheese, Bread, Vegetables etc. sufficiently and yet moderately needs for all that the produce of 4 to 5 acres of land of medium quality.

But even in the South of France, a man can't live on nothing, so $c_1 > 0$. Now let all processes break even. The two goods-producing processes will break even because of pure competition and freedom of entry and exit. Consequently in each industry revenue equals cost:

(6) $$P_i X_i = L_i w + N_i r$$

The labor-producing process will bread even, because (p. 83) "Men multiply like Mice in a barn if they have unlimited Means of Subsistence". Here, too, revenue equals cost or, in more familiar terms, the money wage bill equals the money value of labor's necessary consumption:

(7) $$wL = P_1 C_1$$

Divide (6) by output X_i, use (1) and (2), and find

(8) $$P_i = a_i w + b_i r$$

Divide (7) by employment L, use (5), and find

(9) $$w = P_1 c_1$$

Now we may solve our system.

III. SOLUTIONS

1. Solutions for Factor Prices in Real Terms

Since wages are spent on the first good only the real wage rate is the money wage rate divided by the price of that good. Write (9) as the solution for the real wage rate

$$w/P_1 = c_1 \tag{9}$$

Since rent is spent on the second good only the real rent rate is the money rent rate divided by the price of that good. To find it, write (8) for the first good, insert (9), and express the price of the first good in terms of the money rent rate:

$$P_1 = b_1 r/(1 - a_1 c_1) \tag{10}$$

Then write (8) for the second good, insert (9) and (10),

and find the solution for the real rent rate

$$(11) \qquad r/P_2 = (1 - a_1c_1)/[b_2 + c_1(a_2b_1 - a_1b_2)]$$

2. Solutions for Physical Outputs and Real Income Distribution

Define the money wage and rent bills

$$(12) \qquad W \equiv wL$$

$$(13) \qquad R \equiv rN$$

Cantillon's economy is a stationary one. Nobody saves, then. Consequently, not only are wages spent on the first good only and rent on the second good only; they are *fully* spent:

$$(14) \qquad W = P_1X_1$$

$$(15) \qquad R = P_2X_2$$

Into (15) insert (13) and (11) and find the solution for the second output

$$(16) \qquad X_2 = N(1 - a_1c_1)/[b_2 + c_1(a_2b_1 - a_1b_2)]$$

Into (14) insert (12), (3), (1), and (9) and find first output expressed in terms of second:

$$(17) \qquad X_1 = X_2a_2c_1/(1 - a_1c_1)$$

Finally insert (16) into (17) and find the solution for the first output

$$(18) \qquad X_1 = Na_2c_1/[b_2 + c_1(a_2b_1 - a_1b_2)]$$

According to (14) and (15) $X_1 = W/P_1$ and $X_2 = R/P_2$, so our solutions (16) and (18) for the physical outputs of luxuries and necessities are at the same time solutions for the real incomes of landlords and labor, respectively.

3. Solution for Sustainable Employment

Insert (1), (16) and (18) into (3), rearrange, and find the solution for sustainable employment

$$(19) \qquad L = \frac{a_2/b_2}{1 + b_1c_1(a_2/b_2 - a_1/b_1)} N$$

Partial derivatives of the solution (19) will now generate Cantillon's main conclusions.

IV. CANTILLON'S CONCLUSIONS ON SUSTAINABLE EMPLOYMENT

1. Sustainable Employment and the Labor Intensity of Necessities

Take the partial derivative of (19) with respect to the labor intensity a_1/b_1 of necessities:

$$(20) \qquad \frac{\partial L}{\partial (a_1/b_1)} = \frac{b_1 c_1 a_2/b_2}{[1 + b_1 c_1 (a_2/b_2 - a_1/b_1)]^2} N$$

Here the denominator is a square, hence always positive. In the numerator we have assumed $a_i > 0$, $b_i > 0$, $c_1 > 0$ and must certainly assume $N > 0$. As a result the partial derivative (20) is always positive: The less labor-intensive the necessity is the less employment the economy will sustain.

Cantillon illustrates this result by contrasting two extremes, i. e., the rice economy of China and the bison economy of the American Indian. On pp. 67-69 he describes the Chinese choice of a crop with extremely high labor intensity:

> There is no Country where Population is carried to a greater Height than in China. The common People are supported by Rice and Rice Water; they work almost naked and in the southern Provinces they have three

plentiful harvests of Rice yearly, thanks to their great attention to Agriculture. The Land is never fallow and yields a hundredfold every year. Those who are clothed have generally Clothing of Cotton, which needs so little Land for its production that an Acre of Land, it seems, is capable of producing a Quantity full sufficient for the Clothing of five hundred grown-up Persons... They look upon it as a Crime to lay Land out in Pleasure-Gardens or Parks, defrauding the Public of Maintenance. They carry Travellers in sedan Chairs, and save the work of Horses upon all tasks which can be performed by Men.

Next (p. 69) Cantillon considers the choice of the American Indian of a crop with an extremely low labor intensity:

On the other hand there is no Country where the increase of Population is more limited than among the Savages in the interior parts of America. They neglect Agricul-

ture, live in Woods, and on the Wild Beasts they find there. As their Forests destroy the Sweetness and Substance of the Earth there is little pasture for Animals, and since an Indian eats several Animals in a year, 50 or 100 acres supply only enough food for a single Indian.

Which is better, the austerity of the rice-eating Chinese or the extravagance of the beef-eating American Indian? On p. 85 Cantillon raises that question:

...whether it is better to have a great multitude of Inhabitants, poor and badly provided, than a smaller number, much more at their ease: a million who consume the produce of 6 acres per head or 4 millions who live on the produce of an Acre and a half.

His answer was remarkably modern. He could distingu-

ish analysis from value judgment———was he perhaps the first economist capable of doing so? Therefore his answer was simply that such a question was "outside of my subject".

2. Sustainable Employment and the Labor Intensity of Luxuries

Then take the partial derivative of (19) with respect to the labor intensity a_2/b_2 of luxuries:

$$(21) \qquad \frac{\partial L}{\partial (a_2/b_2)} = \frac{1 - a_1 c_1}{[1 + b_1 c_1 (a_2/b_2 - a_1/b_1)]^2} N$$

Here again, the denominator is a square, hence always positive. In the numerator a_1 is employment in first industry di-

vided by the output of that industry or L_1/X_1. And c_1 is consumption of that output divided by the employment in both industries or C_1/L. But according to (7), (12), and (14) $C_1 = X_1$. Consequently $a_1c_1 = L_1/L$, which is a proper fraction. But if a_1c_1 is a proper fraction, so is $1 - a_1c_1$, and the partial derivative (21) is always positive: The less labor-intensive the luxury good is the less employment the economy will sustain.

Cantillon was concerned about this and explains it carefully. The farmer's choice of crop is influenced by the landlord. Not directly, of course: The landlord doesn't tell his tenant farmer which crop to choose. Cantillon's tenant farmers are independent entrepreneurs who take no orders from their landlord. They rent their land from him and use it as they see fit. But they are market-oriented, so the landlord's influence is an indirect one exerted <u>via</u> his demand in the marketplace (p. 73):

...the Prices [the Proprietors of Land] offer in the Market and their consumption determine the use made of the Land just as if they cultivated it themselves.

Cantillon mentions two examples of such market orientation. First the transportation demand generated by absentee ownership:

If the Proprietors of Land who live in the Country go to reside in the Cities far away from their Land, Horses must be fed for the transport into the City both of their food and that of all the Domestic Servants, Mechanicks and others whom their residence in the City attracts thither.

The carriage of Wine from Burgundy to Paris often costs more than the Wine itself costs in Burgundy; and consequently the Land employed for the upkeep of the cart horses and those who look after them is more con-

siderable than the Land which produces the Wine and supports those who have taken part in its production.

Second (p. 77) Cantillon mentions the demand for imported luxuries:

> If the Ladies of Paris are pleased to wear Brussels Lace, and if France pays for this Lace with Champagne wine, the product of a single Acre of Flax must be paid for with the product of 16,000 acres of land under vines, if my calculations are correct.

So demand has its place in Cantillon's system. Behind demand he finds the preferences of the landlords———the "Taste, Humours and Manner of Living," as he calls them in his succinct summary (p. 81) of the entire system:

> It therefore seems pretty clear that the Number of Inhabitants of a State depends on the Means allotted them of obtaining their Support: and as this Means of Sub-

sistence arises from the Method of cultivating the soil, and this Method depends chiefly on the Taste, Humours and Manner of Living of the Proprietors of Land, the Increase and Decrease of Population also stand on the same Foundation.

V. SUMMARY

With few but powerful strokes Cantillon painted a vivid picture of prerevolutionary and preindustrial France.

Cantillon saw output as bounded by supply but labor as reproducible. The population the available physical stock of land could support would depend, therefore, on the labor intensity of the necessities required to reproduce labor as well as on the labor intensity of the luxuries demanded by landlords according to their "Tastes, Humours and Manner of Living". Absentee owners ———and their ladies———might prefer luxuries with low labor intensity, thus jeopardizing employment.

We have restated Cantillon's model in simple algebra and solved it for real factor prices, physical outputs and real income distribution, and sustainable employment. Our restatement simulates his conclusions.

REFERENCE

R. Cantillon, *Essai sur la nature du commerce en général*. Written around 1730, published 1755, edited and translated by Henry Higgs, London 1931.